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*With a Proposition for improving the
Method of performing Internal
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EXTERNAL ŒSOPHAGOTOMY
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Method of performing Internal Œsophagotomy.**

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IN spite of the immense progress of modern surgical technique and improved operative methods, ably assisted by the antiseptic treatment, the permanent cure of a narrow or impermeable cicatricial stricture of the œsophagus is still one of the most difficult tasks of the surgeon. This will be especially found in children, who naturally look at the doctor who attempts with them any bodily manipulation as their torturer, and therefore struggle with all their might against every effort at dilatation of the obstructed canal by the bougie.

* Read before the New York Surgical Society, March 9, 1892. (For discussion, see *N. Y. Med. Jour.*, July 2, 1892, Proceedings of New York Surgical Society.)

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Two chief methods are applied in the operative treatment of this serious trouble :

1. External œsophagotomy at the spot usually selected for this operation, with consecutive instrumental dilatation from this wound with either bougie or knife, generally with both.
2. Retrograde divulsion, with the help of preliminary gastrostomy.

Before endeavoring to bring out and compare the value and advantages of each of these two methods, I want to state first, as briefly as possible, the history of a case of this kind which recently came under my observation and treatment :

E. B., of Montreal, aged two years and nine months, is the third child of healthy parents. In October, 1890, while being unwatched for a moment, she swallowed some caustic lye which was used by the housemaid for cleansing and polishing the bathtub. The doctor who was immediately sent for ordered a dose of sweet oil, which promptly produced a strong vomiting spell. As far as could be seen, mouth and throat were badly burned, and it could be inferred that the œsophageal canal had suffered also. The little patient was unable to swallow even fluids until two days after the accident. After a week she also partook of a semi-solid diet. From now on everything went well. The child seemed in apparent health until December, 1890, six weeks after the accident. Then she complained of pain and difficulty in swallowing solid food. Soon all the symptoms of a progressive stricture of the œsophagus were noticed. The doctor who was consulted about it was opposed to local treatment as long as deglutition was possible. But when he tried, after a lapse of six more weeks, to push a sound into the stomach he did not succeed. From this time on the child passed through the hands of a number of specialists at Montreal and Toronto, to which latter city the parents moved about that time.

It was noted by all of these gentlemen that there was a stricture right behind the cricoid cartilage, and a second ob-

struction lower down, commencing at a spot which corresponded about to the bifurcation of the trachea. Now and then this latter one was overcome, but the bougie apparently never entered the stomach. Whenever it seemed to pass farther down, the child suddenly became very restless and cyanotic, with long-drawn-out croupous inspirations, and vomited. The same symptoms usually appeared about eight to ten days after the last sounding, which was generally done every twelve days, and were sometimes accompanied by rise of temperature. Then the little sufferer pushed all the five fingers into her mouth, and instinctively tickled the soft palate until she vomited. For the last three months the diet had been entirely fluid. Already in the early summer the doctors had advised an operation, but the parents, unhappily, were opposed to such a treatment, and only saw the absolute necessity of a more heroic interference when the child had nearly died in one of the attacks above described.

When I saw the child at my office, September 9, 1891, it was thin, pale, restless, and slightly cyanotic. When she cried, the inspiration at once became croupous. I abstained from testing the caliber of the œsophagus at this time, deeming it best to do that once thoroughly under an anæsthetic. Mother and child were admitted to the German Hospital. There fluid diet was partaken of. Small quantities seemed to find no special difficulty in their descent to the stomach. Weight, twenty-three pounds. Four days later fever set in; no food was or could be taken. On careful general examination, an apparent organic cause for the rise of temperature could not be found. Dr. A. Jacobi, who at this time saw the patient with me, was likewise unable to diagnosticate any disease. Immediate sounding of the œsophagus in narcosis was therefore decided upon. Temperature, 102° F. After the first whiff of chloroform the face turned blue; a few sounding inspirations, with spasm of the lower jaw and grinding teeth, followed, and respiration stopped. Immediate lowering of the head and extraction of the tongue were resorted to. No relief followed. Tracheotomy was just going to be performed when my finger, which I had pushed far down over the base of the tongue in order to give the air free access to the larynx, suddenly produced vomiting.

At the same moment respiration started up again. Quite a time elapsed before the vomiting of mucus and partially curdled milk ceased. Then the former cyanotic condition disappeared; respiration was entirely free; the examination could be performed. A medium-sized whalebone bougie (*bougie à boule*) met with a stricture right behind the cricoid cartilage. By some slight pressure it was overcome. Two inches and a half lower down the sound was again stopped. After some manipulation, which again induced impeded crowing inspirations and cyanosis, I succeeded in making the bougie enter the stricture for about two inches, but then it was firmly caught. The same result was experienced with thinner bougies. I did not venture to enforce any further progress downward, out of fear of perforating the wall of the œsophagus. Repeated attempts to reach the stomach were made with different sized and shaped bougies on subsequent days without anæsthesia, but likewise failed. Operative interference was clearly indicated. But which operation was the most preferable? In view of the superior stricture, which was directly accessible to the knife, I decided to perform external œsophagotomy.

On account of my absence from the city about that time, the operation had to be deferred until September 30th. Chloroform narcosis was induced, preceded by a hypodermic of three minims of morpho-atropine. This time there was no trouble with the respiration. The incision, about two inches long, split the superior stricture. It was seen that it was caused by a thin, circular, cicatricial, spur-like band, which narrowed the lumen to the size of a lead-pencil. The spur was highest on the side opposite the incision. Thus the canal made a sharp curve at that spot, the convexity pointing to the left. This spur was divided with the scissors transversely at two spots, and the small wounds were united longitudinally with a few interrupted catgut stitches, thus imitating the Heineke-Miculicz method used in pyloroplasty. I now pushed a conical bougie (No. 11 of the French gauge) down toward the stomach, and succeeded in the first attempt, by using some slight pressure, in entering that organ. Bougie No. 12, or a soft-rubber catheter (Nélaton) of this size, encountered insuperable resistance. As a French conical catheter was

not at hand, the bougie No. 11 was left in place. After proper disinfection of the wound, narrow strips of iodoform gauze were put into the depth of the wound at both sides of the œsophagus, and its cut surfaces united with those of the skin with a number of catgut sutures. Rectal alimentation was employed. On the following day the child was doing well; the bougie was exchanged for a catheter (No. 13), and feeding was started from above. Small quantities of water were allowed by the mouth to quench the dry feeling in the throat, but, of course, they appeared at once, as also did the saliva, at the opening in the neck. After three weeks of gradual dilatation, always easily done from the wound in the neck, a Nélaton catheter (No. 26), with a distal opening, passed the stricture. Only the larger sizes, from No. 23 upward, had met with some difficulty—more so whenever the child screamed and resisted. On October 21st the wound had healed, a good lip fistula had been established, and the child had for some time been out of bed.

The subsequent history is of some interest and importance. I will therefore state the different points as briefly as possible, quoting from the history:

October 21st.—No. 27 bougie and catheter refused to pass, probably on account of the struggling of the child. Therefore morphine-chloroform narcosis. Recumbent posture (Rose's), head turned to the right. Irrigation of œsophagus with warm Thiersch's solution. Divulsion of the entire canal with Powell's urethral dilator armed with the rubber cap up to No. 30. This procedure was here just as easily done as in a case of urethral stricture. The instrument was caught at its introduction a number of times in a blind canal. It passed at last by bringing the handle far over to the right. There was therefore a curve to the right. Thus the whole œsophagus formed an S-curve. Irrigation repeated. A soft-rubber catheter, No. 30, passed into the stomach. Temperature later in the evening, 104°.

22d.—No. 30 was exchanged for 22, whereupon the temperature dropped promptly. Probably small tears inside of the canal had been compressed by the snugly-fitting tube. Their discharge was reabsorbed and caused the rise of temperature.

28th.—Deep narcosis; irrigation as before. Divulsion up to No. 35. No. 25 left in. This time no febrile reaction.

November 2d.—Narcosis deep, divulsion up to No. 40 (this number corresponds to the normal caliber of the undilated œsophagus of a grown person at a level with the bifurcation of the trachea*). Slight hæmorrhage from upper portion of œsophagus near the lower angle of the fistula. A stout drainage-tube of 32 was carried down into the stomach stretched over a piece of whalebone and left *in situ*. It slipped out in the following night and could not be replaced by the house surgeon. Other sizes of tube and catheter also refused to pass.

3d.—Light narcosis. Three inches and a half below the fistula there was found an obstacle which seemed at the time impassable for any instrument with a rounded extremity. Whenever that spot was reached and some pressure exerted on the tube, the child coughed hoarsely, yawned, even if fully under the anæsthetic, gagged and vomited, and bit her teeth. Stretching with the dilator created the same symptoms (reflex of the nervus vagus). A conical catheter, No. 21, was at last left in place.

Up to this time the child had been fed on strong, nourishing food. About three quarts of peptones, milk, broth, oatmeal and barley water with peptones, etc., besides three eggs, had been slowly poured into the stomach at regular intervals *pro die*. Nevertheless, the weight, which had at first gone up to twenty-five pounds, had lately rather decreased. Scales showed twenty-three pounds on November 6th. Stools smelled very bad. Evidently a great proportion of the food was not assimilated and left the intestinal tract undigested (dyspeptones). Bill of fare therefore reduced. Probably also the loss of saliva had something to do with the small degree of assimilation.†

6th.—Soft-rubber catheter with distal end No. 26 put in.

* V. Hacker. *Ueber die nach Verätzungen entstehenden Speiseröhrenverengerungen*. Wien, 1889, p. 8.

† Cf. Le Fort. Des indications thérapeutiques dans les rétrécissements cicatriciels et cancéreux de l'œsophage. *Bull. général de thérapeut.*, 1890, No. 2.

10th.—Permanent catheter came out during sleep. It was now entirely dispensed with. For every meal the tube attached to the glass funnel was introduced into the œsophagus for about two inches and then the food allowed to run in. It easily did so whenever the girl kept quiet, but stopped and was slightly regurgitated at once when she screamed. A cup of milk or other fluid was even swallowed without leakage at the fistula, if a condom slightly blown up with air was carefully pressed with the hands on the fistula or held there in place by a bandage.

14th.—Narcosis (mixed, deep). No. 26, which had passed eight days ago, is stopped three to four inches down. All attempts at overcoming the obstruction were futile. The same sensation was experienced as in entering a false urethral passage. Irrigation. After some trying, Powell's dilator slipped in. The instrument was firmly surrounded by the wall of the œsophagus, which thus, four days after the removal of the permanent catheter, had recontracted in its entire lower portion. There was no doubt a tubulous stricture of dense cicatricial tissue about three to four inches long beginning at that often-mentioned spot two inches to two inches and a half from the lower end of the fistula, which corresponded to the bifurcation of the trachea.* Repeated gradual divulsion of the whole tract step by step, from the cardia upward, up to No. 40, found at last great resistance. Marked reflex symptoms as at previous occasions. Irrigation. No subsequent reaction. Feeding without permanent tube as before.

Another test, made November 18th, showed again recontraction.

I now had treated the little patient for nearly eight weeks. Twice a permanent tube up to No. 27 had been borne, but a larger size was always pushed out inside of twenty-four hours. Four times the whole cicatricial tube had been divulsed, twice up to No. 40. Each time the stricture had refused to yield for any length of time. The task was of course to give the œsophagus a caliber which permitted of swallowing all kinds of food and

* I abstained from œsophagoscopy under electric light, as I could not see any advantage in its performance in this case.

could be preserved by passing a sound of at least No. 35 through the mouth. Only then the fistula in the neck could be closed by a second operation. Was there hope of coming to a successful end by continued stretching and divulsing? Or had I to apply to some other resource? The only other means which could still be now tried were electrolysis and direct application of the galvanic current for the sake of reabsorption of the cicatricial tissue, gastrostomy with consequent retrograde divulsion, and internal œsophagotomy.

I decided and got permission of the parents to attack the long lower stricture also with the knife, being well aware of the great danger of this interference.

23d.—Deep, mixed narcosis, Rose's posture. Thorough antiseptic irrigation. Stricture only admits No. 20. Otis's straight urethrotome is held at about three inches below the fistula, but passes after the handle has been carried far to the right. A strong vomiting spell, which is aggravated by screwing up the instrument. Rough cough, grinding of the teeth, great restlessness. Deeper narcosis. Urethrotome screwed up to No. 38. Knife points to the front and left. Division of stricture. Second incision in the same way to the front and right. Hæmorrhage not abundant; mostly venous. Stopped by irrigating with ice-cold Thiersch's solution. No permanent catheter. About ten minutes later another sudden explosion from the stomach. Two large pieces of curdled albumin, by far larger than any ever vomited before, are brought up and extracted through the fistula piecemeal.

4 P. M.—Three hours later, child restless, without fever; rectal alimentation.

9 P. M.—Temperature, 105.2° ; pulse, 148; restlessness increased, general hyperæsthesia.

24th.—Patient struggles when fed. Soft-rubber catheter No. 26 passes without meeting the slightest obstruction or creating hæmorrhage. It nearly drops into the stomach. It is left in place. Within the next forty-eight hours the symptoms of a general meningitis appear. Twisting and spasms all over. Sensory, motor, and vaso-motor centers all involved. Abdomen soft, not tympanitic. No symptoms of lung trouble, pleu-

ritis, or posterior mediastinitis. In spite of very careful nursing, the little patient succumbed on December 2d, nine days after the last operation.*

Post-mortem Examination, by Dr. T. Adler.—No mediastinitis, no peritonitis, no pleuritis. Suppurative meningitis, especially on the right side. Brain soft and pultaceous; nowhere else a suppurative focus. All organs in perfect condition. The œsophagus specimen is of great interest (Fig. 1). The posterior wall of the canal having been split in its entire length, it appears that the upper stricture is entirely cured. Surface smooth. No ridge (Fig. 2, *a*). Lip fistula in the side well established (Fig. 2, *b*).

The lumen of the canal below the superior stricture in the length of fully two inches dilated at least to double the size of the upper portion. Mucous membrane here unchanged. Muscularis thin. In the right half a superficial, nearly healed incision an inch long. (This is the only spot where the second cut, made with the urethrotome, took effect.) The lower stricture, three inches long, begins right behind the bifurcation of the trachea and ends about an inch above the cardia at a spot which corresponds to the hiatus œsophageus of the diaphragm. Mucous membrane of this last-mentioned portion (above cardia) perfectly normal; muscularis and peri-œsophageal tissue not thickened. An inch and a half below entrance to inferior stricture (and three inches and a half below the lower angle of the fistula in the neck), on the right side of the œsophagus, a false passage three quarters of an inch long (Fig. 2, *c*). Its entrance is marked by deep, irregular wrinkles of cicatricial tissue. A tongue-like process of normal mucous membrane extends downward within half an inch from this spot as a direct continuation of the upper normal mucous lining. The entire other surface of the stricture is covered with cicatrix.

Cut resulting from internal œsophagotomy in the left half of the canal (first incision), three inches long and a quarter of an

* The constant presence of the œsophageal tube proved of the greatest benefit in this serious illness. Feeding could be kept up with excellent regularity. Digestion and assimilation went on uninterrupted, as demonstrated by the normal defecation and micturition.

inch deep, gaping, smooth, without surrounding inflammatory symptoms, entering the muscularis, nowhere penetrating (Fig. 2. *d*). Its direction points toward the tissue in front of the aorta. It has thoroughly divided the convex side of the stricture in its entire length* and swelled the caliber of the latter to at least No. 40 French. (Circumference nowhere less than an inch and a half, measured on the specimen which is hardened in alcohol.)

Mucous membrane of the stomach appears normal in all its parts.

There is no doubt that the remote cause of death was internal œsophagotomy, and the immediate, pyæmia, with the only one local inflammatory manifestation—"suppurative meningitis." Streptococci had entered the circulation in the œsophageal wound where venous bleeding at the time of operation had been especially marked, passed the capillaries of the pulmonary arteries which are the widest in our system, and were carried into the smaller ones of the brain as infectious emboli.

Could this result have been avoided? Was there any other way to cure the patient? In other words, had internal œsophagotomy been clearly indicated?

* This fact refutes von Hacker's statement (*l. c.*, p. 117): "Larger strictures can not be fully divided with the help of internal œsophagotomy neither from above downward nor in the opposite direction. The post-mortem examination showed in all these cases an incision in the upper or lower half of the stricture only." The use of the urethrotome—which, when screwed up, brings the wall of the œsophagus on the stretch—enables an incision of the entire stenosed portion. That this be true is well demonstrated by my case. The depth of this incision will, of course, vary at different spots if the course of the stricture is curved. It will be deepest at the greatest convexity, provided the knife was turned to this side first, and this, I believe, should always be done. A thorough incision on one side alone seems to me to be sufficient. A second one can have effect only if the stricture is cut larger size with this second incision.

In trying to give a satisfactory answer to this, here vital, point three questions ought to be considered :

1. Could the former treatment, with the additional use of electrolysis or direct application of the galvanic current, have effected a cure if it had been carried out longer ?

2. Was death due to the mode of carrying out the internal division of the stricture ?

3. Would gastrostomy with retrograde divulsion have promised a permanent, quicker, and safer result ?

With reference to the first question, the assumption will probably find little opposition that a longer-continued divulsion would, in this case at least, not have promised any further improvement. The stricture was long, cylindrical, and dense ; it had to recontract after simple stretching.* More rapid and forced divulsion seemed to me too dangerous and not indicated. At one or the other spot the œsophageal wall might have ruptured and septic mediastinitis set up. Rapid divulsion, moreover, gives an unfavorable prognosis with reference to the permanency of the obtained result.

Perhaps the application of the ordinary galvanic current (one to two elements), cathode inside of the stricture, might have reabsorbed some of the cicatricial tissue. But a constant improvement was not to be expected by it. Electrolysis, although having proved of use in the hands of others,† also promised very little in this case in view of the length and the tubulous character of the stricture.

The stricture therefore had to be divided with the

* A glance at the specimen also proves this view to be correct. The œsophageal wall, with the thickened peri-œsophageal tissue, is at the seat of the lower stricture at least four times as thick as at other normal spots.

† F. Hjort. Die Behandlung der Speiseröhrenverengungen. *Achte Sitzung d. Intern. med. Cong. zu Kopenhagen*, 1884. Rep. in *Ctrbl. f. Chirurgie*, 1886, p. 69. Electrolysis was here carried out after gastrostomy in a retrograde manner in one case with a most satisfactory result.

knife unless I combined gastrostomy with retrograde slow divulsion first as a trial. Which method of internal cutting was, under the circumstances, the most preferable? Incision with a blunt-pointed and long-handled bistoury or with a herniotome which had to be introduced alongside a grooved director,* or alongside a small rubber bougie (as used for cutting an anterior urethral stricture) was here impossible on account of the curve of the narrow stricture. A special œsophagotome, according to Trélat, Collin, or others, was not at hand.† A urethrotome—which, as I afterward found in perusing the literature, had only once been used before in this operation‡—seemed to offer the best advantages.

The choice of the proper instrument, however, was not the main point at issue. It was that to every case of internal œsophagotomy, even to-day, one immense danger is attached—namely, impossibility of previous disinfection. If there had been a way of thoroughly disinfecting the œsophagus before cutting the stricture, as we are accustomed and bound to do in the urethra before internal urethrotomy, I am sure my little patient would not have

* C. Gussenbauer. Ueber kombinierte Oesophagotomie. *Zeitschrift für Heilkunde*, vol. iv, p. 33.

† If gastrostomy had been done, the small triangular knives recommended by F. Lange, of this city, which are pulled through the stricture on a thread from below, would have come into consideration.

‡ Cf. K. G. Lennander. Narbenstricture des Oes. bei einem zweijährigen Kinde. Aeussere Oesophagotomie. Genesung. *Rep. Utrbl. f. Chir.*, 1890, p. 148. Lennander used Maisonneuve's urethrotome, which cuts from anteriorly backward. This is especially dangerous. It may thus happen that the instrument is introduced into a false passage and the knife divides the wall of the latter (cf. v. Hacker, *l. c.*, p. 66 and following pages). The internal œsophagotomy should always be done retrograde, the knife having first passed beyond the stricture. Gradual blunt dilatation, therefore, has to precede the internal cutting if the stenosis is very tight. In a number of cases a guide pushed up from the stomach will lead the way. (See below.)

died, but probably be cured to-day; for that only a *free* division of the contracted long cicatricial tube does really "cure" such a stricture which does not yield to stretching, where false passages have been bored by the frequent attempts at sounding from the mouth, I am fully satisfied. I would put the *radical treatment* of these contractions on exactly the same basis as that of urethral strictures.

Unhappily, the surgery of the posterior mediastinum has not yet advanced so far as to enable us to attack the lower œsophageal stricture as we do the upper ones—from outside. Perhaps surgery will never attempt as much, and, if it would, such an undertaking would perhaps be unwise and impracticable. There are no soft tissues around which in cicatrizing with the œsophageal wound would pull its cut surfaces outward in the shape of a funnel, as the perinæum does after external urethrotomy, thus partially guarding against a recurrence of the trouble. I therefore believe that rebellious strictures of the œsophagus in its intrathoracic portion must always be divided *from the inside*, provided they are divided at all. Such a thorough operation, with the help of a *deep* incision, is here of course accompanied, besides the probable septic infection, as emphasized before, by another great danger—perforation of the œsophageal wall by the knife, with subsequent posterior mediastinitis, pleuritis, or arterial fatal hæmorrhage from the aorta or common carotid. The latter accident can partially be avoided by not carrying the incision so deep as to penetrate the œsophageal wall in its entire thickness. It will be a matter of personal tact and judgment to avoid such an accident as much as possible. A number of shallow cuts with subsequent dilatation, if necessary repeated, might in some cases prove of permanent benefit.* Still we have a right to presume that a

* Von Bergmann (Ueber Operationen an Schlundröhre, *Deutsche med. Wochenschr.*, 1883, No. 42 ü. 43) wants internal œsophagotomy

good deep cut which thoroughly divides the cicatricial mass in its entire length, as it had been done in my case, promises a real radical cure, without necessitating further or continued regular sounding for many years, perhaps for life. It will then be sufficient to test the caliber once or twice a year, as is the rule in strictures of the urethra which have been cut.*

Reabsorption of septic material can of course take place as well from a superficial as from a deep wound. This scar tissue, after some time, generally is quite vascular, especially if irritated by instrumental manipulations. This also would be my answer to any one who might say that the fatal result in my case had been due to the depth of the incision, which, as mentioned above, implicated the muscular part of the canal. I firmly believe that, the same hard luck being imminent, a more superficial wound in that spot could just as well have given entrance to the streptococci which caused the fatal blood poisoning.

I still have to answer the third question put above: Would gastrostomy with retrograde divulsion have given a better result in this case? I believe decidedly not. Besides the necessity which presented itself in my patient to attack the superior constricting ring with the knife, which for effect-

done only in cases where a cicatricial, very short, still permeable, valve-like stricture refuses to yield to gradual dilatation. He advocates a "superficial, multiple *débridement*." In a case similar to the one described before, I would, in the future, probably also first satisfy myself with one or two more superficial incisions, and repeat them if necessary, protected by the method proposed below, after having tried retrograde divulsion. I would then first perform internal œsophagotomy on a tubulous stricture, without screwing up the urethrotome to the desired caliber at once—rather proceed gradually.

* But the deep, thorough division of the stricture, made as in urethrotomy, should in all these cases be the very last resort, in view of its manifold dangerous consequences.

ing a radical cure could of course only be done correctly by external œsophagotomy, it can be taken for granted that stretching from below would have likewise been followed by recontraction, even if a larger size of tubes or bougies could have been passed and left *in situ*. Of course not all strictures of the lower portion of the œsophagus present the same difficulties of treatment. Many *can* be stretched by long-continued sounding and kept patent if tested now and then. The sooner this treatment is started, the oftener subsequent trouble and operative treatment can be avoided. In fact, as the stricture is bound to come in the majority of cases, sounding should always be started about two to four weeks after the accident, and kept up at regular intervals with increasing sizes of the bougies, if possible, for many years, perhaps for life.* The majority of these patients will, of course, not listen to such urgent medical advice, and the family physician, who mostly gets these cases first in hand, will often neglect to submit his resisting client to this clearly indicated prophylactic but painful treatment. Thus, after some time surgical help is generally called for. Should, then, gastrostomy or œsophagotomy be performed? It would be absurd to draw definite conclusions in this direction from the experience in one single case. Still, I should venture to say that, in children at least, external œsophagotomy and subsequent stretching from above seems to me to be the preferable operation—the one which should be first tried.

How easily and often also in older patients the so called impermeable stricture of the œsophagus in its thoracic

* Maydl (Die Magen-Chirurgie der letzten fünf Jahre, *Internat. klin. Rundschau*, 1887) proposes to perform gastrostomy at once, right after the cauterization of the œsophagus, and von Hacker (*loc. cit.*, p. 121) adds to this proposition the one to start sounding of the œsophagus with the help of this gastric fistula two or three weeks later.

portion can be successfully overcome and widened from a wound in the neck, has only very lately been again emphasized by Graser, of Erlangen.* He stated how easily a sound would glide through a strictured œsophagus into the stomach from an opening in the neck, which had persistently refused to enter and pass the stricture from the mouth. From a fistula in the neck the sound has to pass a straight way downward to the stenosis, whereas from the mouth this way is curved. The entrance to the stricture is thus easier found. The bougie or tube, if left in place, causes no annoyance and can soon be exchanged for a larger size. It took, in some cases, only one week before the largest size met the stricture without difficulty. The lip fistula in the neck is closed as soon as the sound can also be passed with equal ease from the mouth down into the stomach.

In children, where it is especially important, we can avoid by the œsophageal operation the annoying constant gagging and vomiting which the presence of a tube in the throat and mouth or in nasopharynx and nose drawn up through the gastric fistula necessarily produces, for some time, more so if it is left *in situ*. And this again is advisable, because it is well known that rapid dilatation is best done by permanent catheterism.†

On the other hand, gastrostomy is also a comparatively easy and safe operation. If carried out according to von Hacker (that is, by splitting the left rectus muscle longitudinally and using its belly as an artificial constrictor),‡

* Zur Behandlung der Oesophagus-Stenosen. *Verhandlungen der deutschen Gesellschaft für Chirurgie*, XIX. Congress, 1890, p. 136.

† The loss of saliva, which mostly passes through the wound in the neck and seems not to be insignificant for nutrition, can partially be avoided by tying a blown-up rubber bulb on the fistula.

‡ *Wiener med. Wochenschrift*, 1886, Nos. 31 and 32.

the leakage can with certainty be avoided; and, if the von Hacker-Scheimpflug* cannula is put in, feeding with semi-solid and solid diet may be at once begun. This is a very important factor in patients who have become greatly emaciated. After external œsophagotomy, only fluid diet can in the beginning be given, on account of the narrow caliber of the permanent catheter.

I have brought along here this cannula, as it was made for me by the W. F. Ford Surgical Instrument Company. I wanted to use it in a patient of mine, seventy-one years old, who had been operated upon by me according to von Hacker's method for cancerous stricture of the œsophagus, and had an excellent, perfectly patent fistula through the rectus muscle still, after nine months.† In this fistula he was wearing a stout rubber tube. Three days before I received the cannula from the instrument company the patient suddenly died from an intercurrent pneumonia inside of two days.

As is shown in the accompanying cut (Fig. 4, which represents schematically the cannula in position), this cannula, made of silver, is constructed according to the principle as represented in Trendelenburg's tampon-cannula for the trachea. It can be easily made in different dimensions, according to the width and depth of the gastric fistula, by any instrument maker. A double rubber balloon of hour-glass shape, each part of which can be blown up with the help of the small tube running inside the larger one (Fig. 4, *t*), is pushed over the cannula and fastened there in shallow grooves (Fig. 4, *g*) with silk threads (Fig. 4, *s*). The rubber tube in the middle, which connects the two balloons, is best tied on the cannula, in the length of about a quarter of an inch, by simply running a silk thread around it a

* *Wiener klin. Wochenschrift*, 1888, pp. 491, 517.

† Cf. *New York Medical Journal*, 1891, p. 521.

number of times. Thus a free space is formed between the two blown-up balloons which will not press upon the borders of the fistulous tract. If the latter is still sore, a piece of iodoform gauze, dry or spread with a salve, can

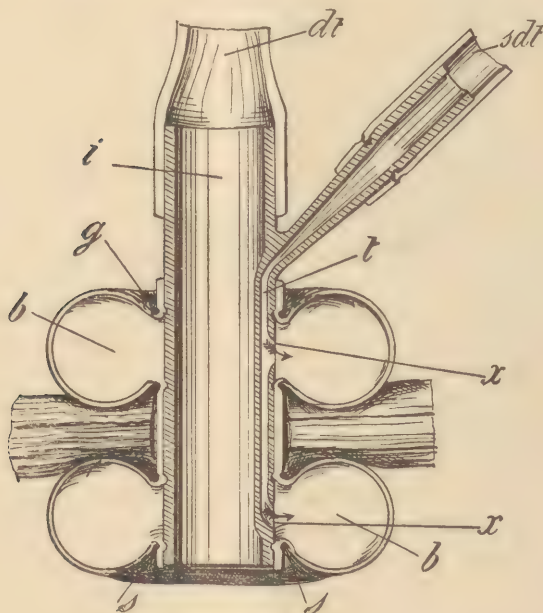


FIG. 4.

be conveniently rolled around this spot. It is firmly held in place by the two balloons. The latter, when distended, must take the shape of air-pillows, which fit water-tight all around and should not press the borders of the fistula (Fig. 4, *b*). This point is especially important with reference to the lower one. To put the whole into working order, a drainage-tube of any desirable length is fastened to the outer end of the large cannula (Fig. 4, *dt*) and closed by a

clamp. Through it the food is poured into the stomach (Fig. 3). Another rubber drainage-tube is tied on the small funnel-shaped silver tube to facilitate proper filling of the balloons (Fig. 4, *sdt*).

The sounding from below itself has been greatly facilitated by the method published by Hagenbach,* advised for strictures which are still permeable. A shot on a long thread is swallowed. The one end of the thread is held in front of the mouth and the other end drawn out of the stomach through the gastric fistula. A strong silk thread is then tied to the lower end of the first one outside of the abdominal wall and pulled through the stricture and out of the mouth. Both ends are then tied together. Every day a sound is tied to the thread outside of the stomach and drawn through fistula, cardia, and œsophagus upward. The size can be rapidly increased. The thread is constantly left *in situ*, and does not cause any inconvenience.

If the stricture is impermeable from above, the cardia must be searched for through the gastric fistula. The tube and electric light, as used in urethroscopy, may there often be of great service to detect the sometimes greatly drawn aside and constricted lumen. If found, a thin bougie is pushed up through into the mouth. This retrograde treatment is continued so long until the same large-sized tube passes the stricture from above just as easily as it is pulled through with the help of the guide from below upward. Then the opening in the stomach and the abdominal wound are closed by special suture. Of course, this second operation is more difficult and serious than that done for closing the lateral opening in the œsophagus at the neck.† In order to esti-

* Kasuistische Beiträge zur retrograden Dilatation von Oesophagus-stricturen (aus der chirurg. Klinik zur Basel). *Korrespondenzblatt f. schweizer Aerzte*, 1889, No. 5.

† If gastrostomy was done through the belly of the left rectus muscle, the gastric fistula might eventually close without further operating

mate the real value of retrograde dilatation without an internal cutting operation, the result obtained should be re-examined after one to three years. In a number of these cases internal œsophagotomy had, and will still have, to be added, with, of course, not less danger than in any other case. We always are forced to resort to it if the stricture does not yield to larger sizes of the bougie, or if it rapidly recontracts.

Among the one hundred clinical cases of cicatricial stricture of the œsophagus selected and reported by von Hacker (*l. c.*), I find internal œsophagotomy performed fourteen times* (in one case it had to be done twice). In five it had been combined with the external incision (Cases I, XI, XIII [2], LII, XCIX of the tabula; Case XIII is the one just referred to; both operations were done here twice, combined, by Gussenbauer). Of these five cases, three were cured, one died of hæmorrhage fifteen days after the operation; one of mediastinitis, pleuritis, and peritonitis on the third day after the operation. (Sands's patient, mentioned in foot-note, died of shock twelve hours after the operation.) Of the remaining eight, where internal œsophagotomy alone had been done, six are reported as cured, one died three months after the operation of suppurative pleuritis and pneumonia, another of mediastinitis and pleuritis. Meningitis as a sequela to the operation in question, as observed in my case, I found nowhere reported. But even one single case of such a kind gives sufficient proof that, with internal œsophagotomy as heretofore performed, we may well escape the dangers which often, sooner or later, as soon as the tube, which passed through it into the stomach, had been removed. The fistula in the neck may now and then also heal in this way.

* In looking up a few of the reported cases in the original, I find that one case of combined œsophagotomy done by Sands (*N. Y. Med. Jour.*, 1884 p. 534) has not been included in the tabula. (Boy.)

followed its performance—namely, pleuritis, mediastinitis, peritonitis, and pneumonia—but still can be shipwrecked on the rock which so far was in our way in every one of these cases: the necessity of doing a cutting operation in a field which could not be disinfected either before or after its performance.

Have we, then, no means to guard against blood poisoning in this operation? Can not a method be found which lets us operate in a thoroughly disinfected field? I believe it can, and I should propose to proceed in the following manner:

If external œsophagotomy had been primarily performed, gastrostomy has to be added, and *vice versa*. Thus that portion of the œsophagus which presents the operating field is temporarily excluded from the digestive tract. Before starting the internal incision, irrigate the œsophagus from the fistula in the neck downward with Thiersch's solution, or a solution of permanganate of potassium, allowing the water to pass out of the gastric opening, and during a sufficiently long time to be sure that this portion of the canal is thoroughly disinfected. Also carefully wash the stomach from below. (This preparatory treatment may be repeated during a number of days.) Push an iodoformized sponge, or a ball of iodoform gauze on a thread, into the upper portion of the œsophagus, between the opening in the neck and pharynx, so as to guard against the descent of the secretions of the mouth. Then do internal œsophagotomy, under constant irrigation, from the wound in the neck downward. Continue same after the operation is finished. The water will run into the stomach and readily escape through the gastric fistula. At last pull an iodoformized sponge or a ball of iodoform gauze, with the help of a bougie and thread, through the gastric opening and the cardia into the lower end of the œsophagus. This will prevent regur-

gitation of the contents of the stomach in the subsequent direct feeding through the abdominal opening. Of course, also rectal alimentation could be resorted to in the first four to five days. But that would seem to be a rather unnecessary precaution. If desired, frequent antiseptic irrigation of that portion of the œsophagus between the two plugs, by way of the wound in the neck, could be added, the patient being in the recumbent posture.

I trust that this my proposition with reference to internal œsophagotomy according to antiseptic principles would render it just as safe, in this respect at least, as internal urethrotomy. It can then be carried out with the instruments as used in urethral surgery. If Gerster's urethrotome can be passed through the stricture, it will deserve preference, as it stretches the stricture transversely over the instrument. The dividing knife will then less easily cut through the œsophageal wall. For older children and grown persons these instruments, then, have to be made in a larger size, or rather longer, which, no doubt, can be quite easily done.

In conclusion, I offer the following propositions :

1. After swallowing acids, etc., sounding should be begun as soon as it can be made out that the internal wounds have healed, certainly not later than two to four weeks after the accident. This prophylactic treatment has to be continued at regular intervals for a long period—if necessary, for life. Gastrostomy can be primarily performed for this purpose (Maydl, von Hacker).

2. If a stricture of the œsophagus has developed and is impermeable from the mouth, the patient should be submitted to an operation as early as possible. No forcible dilatation or boring with the sound should be permitted. If the latter is done, the formation of a false passage is favored. The œsophagus has thus often been perforated.

3. External œsophagotomy for the establishment of a temporary fistula in the neck (œsophagostomy) will be found useful and sufficient in many of these cases, especially in children. The stricture can be generally passed quite easily from this opening. A tube can be left *in situ* without the annoyances which are caused by passing it through the nose and pharynx. This operation is always indicated if, besides an impermeable stricture in the lower portion of the œsophagus or behind the bifurcation of the trachea, a second (or third) one is present at a level with, or not far below, the cricoid cartilage.

4. In grown patients and those who are emaciated and require immediate forcible nutrition, primary gastrostomy, with subsequent retrograde sounding, may be preferable.

5. If the stricture has been successfully stretched, and if the same sound which passed from the wound in the neck can also be pushed down through the mouth, the fistula has to be closed. If gastrostomy had been performed, this second operation generally requires laparotomy and separate suture of stomach and abdominal wound.

6. In a number of cases there is a limit to stretching and divulsion, or the repeatedly widened stricture rapidly recontracts. Then internal œsophagotomy is indicated as the only means to cure the patient.

7. Internal œsophagotomy, if performed under these circumstances, is a very dangerous operation, especially on account of our present lack of means to render the operating field free of infectious material.

8. A thorough disinfection of the intrathoracic portion of the œsophagus seems feasible by first adding gastrostomy to external œsophagotomy, and *vice versa*. Then the operating field and the stomach can be cleansed by antiseptic irrigation before and after the operation. Through temporary antiseptic tamponade of the cardiac portion of the

œsophagus and of that between the fistula in the neck and pharynx we may hope to guard against contamination of the wound.

9. From a wound in the neck internal œsophagotomy can be carried out in the same way and with the same instruments as used for dividing strictures of the anterior urethra from within. The division should be made in a retrograde way only, the knife having been first passed beyond the stricture. A guide pushed up from the gastric fistula will help to accomplish this, even in obstinate cases. It may become necessary, especially in adults, to have an instrument of a special length, and sometimes also curve, constructed for this purpose.

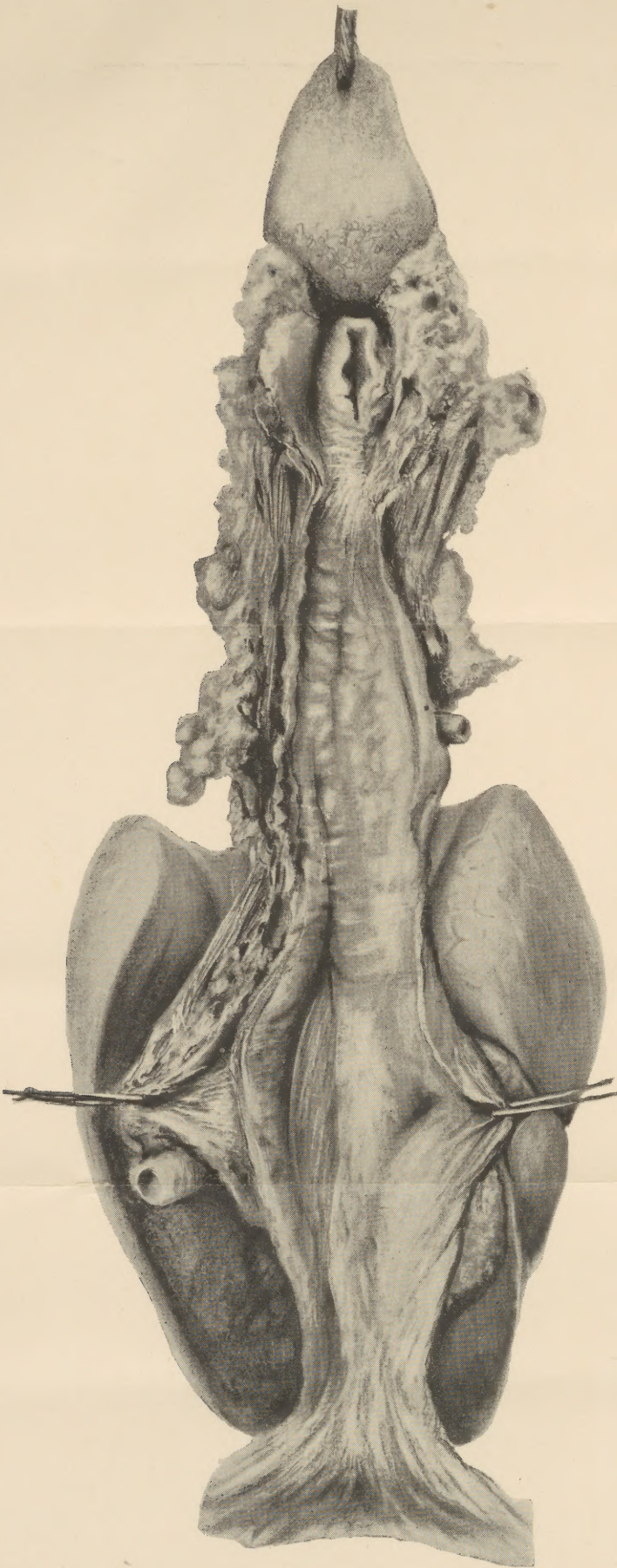


FIG. 1.

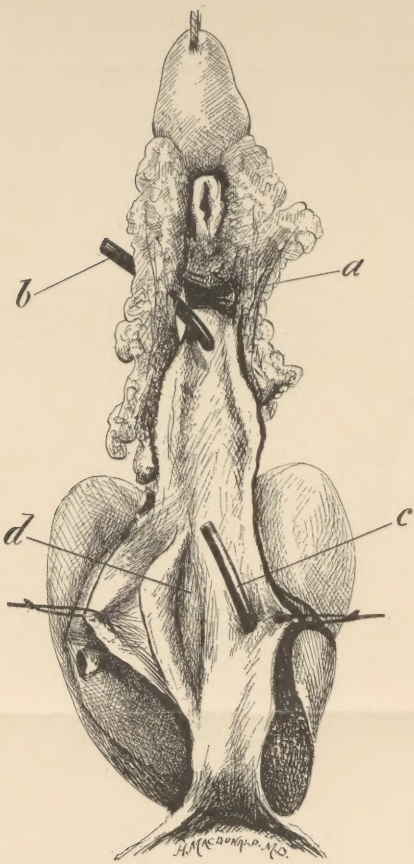


FIG. 2.

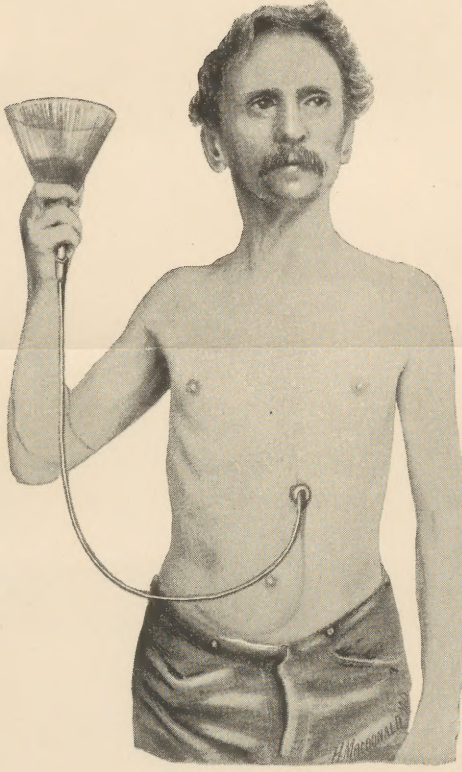


FIG. 3.



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